

ARGUMENTS AGAINST S. 5

Embryonic stem cell research is unethical.

- Requires the destruction of human embryos
- Question is not one of whether research can be done – no federal laws or regulations prohibit the research. The issue is solely one of taxpayer funding: *Should American taxpayers who are morally opposed to embryo-killing research be forced to pay for it?*
- S. 5 claims to fund research on so-called “leftover” IVF embryos, but there are not enough. Federal funding of embryonic stem cell research will provide an incentive to create more embryos, either through IVF procedures or cloning, for research.
 - A RAND study found that around 400,000 frozen embryos currently are being stored in IVF clinics in the U.S. Most of those are not genetically diverse. Less than 3% have been designated by their parents for research, and RAND concluded at most 275 new stem cell lines could be created. The “leftover” embryos will not generate nearly as many stem cell lines as proponents of S. 5 claim.
 - These embryos will have to come from an alternate source, once the IVF clinics run out of surplus – leading to the creation of embryos for research purposes through IVF procedures or through cloning.
 - Either of those options requires eggs, which have to come from women. Harvesting women’s eggs presents many health risks to the women, especially when quantities are artificially enhanced.

Embryonic stem cell research doesn’t work.

- As opposed to adult stem cell research, which has produced proven treatments for over 70 diseases, embryonic stem cell research has few modest successes in animal trials, and NONE in human clinical trials.

Embryonic stem cell research is unsafe.

- In animal trials, embryonic stem cells have produced tumors.
 - IWakitani S *et al.*, “Embryonic stem cells injected into the mouse knee joint form teratomas and subsequently destroy the joint,” *Rheumatology* 42, 162-165; Jan 2003
- In animal trials, embryonic stem cells have caused transplant rejection.
- In animal trials, embryonic stem cells have formed the wrong kinds of cells.
 - Quotes from proponents of ESCR:
 - “Normally, if you take an embryonic stem cell, it will make all kinds of things, sort of willy-nilly.” – Doug Melton, “Stem Cells 101”, PBS “Scientific American Frontiers,” May 28, 2002, <http://www.pbs.org/saf/1209/features/stemcell.htm>
 - “Transplanted ES cells spontaneously differentiate into any of a variety of ectodermal, endodermal and mesodermal cell types—sometimes into a disorganized mass of neurons, cartilage and muscle; sometimes into teratomas containing an eye, hair or even teeth.” – Robert P. Lanza, Jose B. Cibelli, & Michael D. West; “Human therapeutic cloning”; *Nature Medicine* 5, 975-977; September 1999.
 - “Rarely have specific growth factors or culture conditions led to establishment of cultures containing a single cell type.” “Furthermore, there is significant culture-to-culture variability in the development of a particular phenotype under identical growth factor conditions.” “[T]he possibility arises that transplantation of differentiated human ES cell derivatives into human recipients may result in the formation of ES cell-derived tumors.”
– Jon S. Odorico, Dan S. Kaufman, James A. Thomson, “Multilineage differentiation from human embryonic stem cell lines,” *Stem Cells* 19, 193-204; 2001
 - “There are still many hurdles to clear before embryonic stem cells can be used therapeutically. For example, because undifferentiated embryonic stem cells can form tumors after transplantation in histocompatible animals, it is important to determine an appropriate state of differentiation before transplantation. Differentiation protocols for many cell types have yet to

be established. Targeting the differentiated cells to the appropriate organ and the appropriate part of the organ is also a challenge.” “At the moment, 15 such cell lines are available, and they are reportedly difficult to obtain, difficult to maintain, or poorly characterized.” – Elizabeth G. Phimister and Jeffrey M. Drazen, “Two fillips for human embryonic stem cells,” *New England Journal of Medicine* published online 27 February 2004

Embryonic stem cell research provides incentives for cloning.

- Proponents of embryonic stem cell research claim that they intend to use so-called “leftover” IVF embryos, but there are not enough.
- A RAND study found that around 400,000 frozen embryos currently are being stored in IVF clinics in the U.S. Most of those are not genetically diverse. Less than 3% have been designated by their parents for research, and RAND concluded at most, 275 new stem cell lines could be created. The “leftover” embryos will not generate nearly as many stem cell lines as proponents of S. 5 claim.
- These embryos will have to come from an alternate source, once the IVF clinics run out of surplus – leading to the creation of embryos for research purposes through IVF procedures or through cloning.
- Either of those options requires eggs, which have to come from women. Harvesting women’s eggs presents many health risks to the women, especially when quantities are artificially enhanced.
- Embryonic stem cell research will also likely lead to the cloning of human embryos in order to avoid tissue rejection issues. The major reason adult stem cells have been successful in human therapies is because people are treated using their own adult stem cells, thus avoiding the tissue rejection issues.

Embryonic stem cell research is problematic.

- Difficult to establish and maintain
- Difficulty in obtaining pure cultures in the dish
- Questions regarding functional differentiation
 - Sipione S *et al.*, “Insulin expressing cells from differentiated embryonic stem cells are not beta cells”, *Diabetologia* published online 14 Feb 2004; doi:10.1007/s00125-004-1349-z
 - Rajagopal J *et al.*; “Insulin staining of ES cell progeny from insulin uptake”; *Science* 299, 363; 17 Jan 2003
 - Zhang YM *et al.*; “Stem cell-derived cardiomyocytes demonstrate arrhythmic potential”; *Circulation* 106, 1294-1299; 3 September 2002
- Genomic instability
 - Cowan CA *et al.*, “Derivation of embryonic stem-cell lines from human blastocysts”, *New England Journal of Medicine* 350, 13; published online 3 March 2004
 - Draper JS *et al.*, “Recurrent gain of chromosomes 17q and 12 in cultured human embryonic stem cells”, *Nature Biotechnology* 22, 53-54; January 2004
 - Humpherys S *et al.*; “Epigenetic instability in ES cells and cloned mice”; *Science* 293, 95-97; 6 July 2001

Embryonic stem cell research is unnecessary.

- Adult stem cell research is being used to treat patients now for over 70 (possibly as many as 80) diseases. Embryonic stem cell research has produced few modest successes in animals for ESCR and NO human clinical treatments.
- Adult stem cells are widely available—found throughout the body (dental pulp, fat, nose, hair follicles, bone marrow, brain, etc), and in cord blood, placental and amniotic fluid.
- Adult stem cells do not tend to form tumors, unlike embryonic stem cells, which have caused tumors in animal trials.
- No ethical problems using adult stem cells.